M. P. M. (Sem. I) (CBCS) Examination
January - 2018
BP 105-B : Remedial Mathematics
(Pharmacy) (Old Course)

Faculty Code : 014
Subject Code : 003109

Time : Hours]   [Total Marks : **80**

Instructions : (1) Figures to the right indicates marks.

(2) Answer any two from Q. 2, 3, 4 of SECTION-I and Q. 6, 7, 8 of SECTION-II.

(3) Q.-1 and 5 (of marks 14) are compulsory.

SECTION - I

1 Attempt any seven :   **7×2=14**

(a) Let $A = \{a, b, c\}$ and $B = \{1, 3\}$. Write down the set $A \times B$.

(b) Let $A = \{1, 2, 3\}$, $B = \{3, 4\}$. Write down the sets $A \cap B$ and $A \cup B$.

(c) What is value of $\lim_{x \to 2} 3x^3 + x^2 - x + 5$.

(d) If $f(x) = \dfrac{x+1}{3}$, then find $f^{-1}(x)$.

(e) If $f(x) = 3x^3 + x^2 - x + 5$, then find $f(0)$ and $f(2)$.

(f) Find $g'(x)$, when $g(x) = 3x^2 + 2x - x + 5$, where $g'(x)$ is the derivative of $g(x)$.

(g) Find the value of $\int \left(x^5 + 3x^2 \right) dx$.

(h) Write down following formulas :

$$\frac{d}{dx}(\tan x) = \dots\dots, \quad \frac{d}{x}(\sin x) = \dots\dots?$$

2 (a) Attempt any four : 4 × 2 = 8

(i) Let $A = \{1, 3, 5\}$, $B = \{3, 5, 7, 10\}$. Find $A \cap B$ and $A \cup B$.

(ii) Find $\frac{d}{dx}\left[(2x+6)^2\right]$.

(iii) Find $\frac{d}{dx}\left[4e^x + 5x^2\right]$.

(iv) Find $\frac{d}{dx}\left[\sin\left(x^3\right)\right]$.

(v) Give definition of a relation from a set A into another set B.

(b) Attempt any one : 1×5=5

(1) Let $f : \mathbb{N} \to \mathbb{N}$ and $f(x) = 2x + 3$, $\forall\, x \in \mathbb{N}$. Prove that f is one-one and onto map. Find $f^{-1}(x)$.

(2) Prove that $\lim\limits_{x \to 0} \dfrac{2(\tan x - \sin x)}{x^3} = 1$.

3 (a) Attmept any one : 1×4=4

(i) Find the value of $\lim\limits_{x \to 0}\left[\dfrac{\sin x + e^x + \tan x - 1}{x}\right]$.

(ii) Find the value of $\lim\limits_{x \to 0}\left[\dfrac{5^x - 11^x}{x}\right]$.

(b) Attempt any three :   **3×3=9**

(1) Prove that $\dfrac{d}{dx}\left(\sqrt{5x+e^x}\right)=\dfrac{e^x+5}{2\sqrt{5x+e^x}}$.

(2) Define following terms :

function, one-one function and onto function

(3) Describe about method of substitution for integration.

(4) Find $\int\left(x^3+x+1\right)^5(3x+1)\,dx$, using method of substitution.

(5) Find $fofof(x)$, when $f(x)=\dfrac{1}{1-x}$.

4   (a)   Attempt any one :   **1×3=3**

(i) Let $A=\{1,2,3\}$, $B=\{a,b,c,d\}$ and R is a relation

from A into B given by $R=\{(1,a),(2,b),(1,c),(3,c)\}$.

Find R^{-1} and draw Vann-diagram of R^{-1}.

(ii) Let $f:\mathbb{N}\to\mathbb{N}$ defined by $f(x)=2x^2$. Is f one-one

or onto ? Justify your answer.

(b)   Attempt any two :   **2×5=10**

(1) Find $\dfrac{d}{dx}\left[e^{\sin x}\right],\ \dfrac{d}{dx}\left[e^{x^2}\right]$.

(2) Find $\dfrac{dy}{dx}$, when $y=\sin^m x\cdot\cos^n x$.

(3) Let $y = \log(\sin x)$. Prove that $\dfrac{dy}{dx} = \cot x$ and

$$\frac{d^2 y}{dx^2} = -\mathrm{cosec}^2 x.$$

SECTION - II

5 Attempt any two : **2×7=14**

(1) Let $y = e^{n\cos^{-1} x}$. Prove that $\left(1 - x^2\right) y_2 - x y_1 = n^2 y$.

(2) Prove that $\dfrac{d}{dx}\left[\left(x^4 + 5x^2 + 1\right)\left(e^x - \cos x\right)\right] =$

$x^4\left(e^x + \sin x\right) + 4x^3\left(e^x - \cos x\right) + 5x^2\left(e^x + \sin x\right) +$

$10x\left(e^x - \cos x\right) + e^x + \sin x$.

(3) Prove that $\dfrac{d}{dx}\left[e^x \cdot \log x \cdot \tan x\right]$

$= e^x\left[\dfrac{\tan x}{x} + \tan x \cdot \log x + \log x \cdot \sec^2 x\right]$

6 (a) Draw graph of the function $y = \log x$. **4**

(b) Show that $\dfrac{d}{dx}\left[x^n\right] = n x^{n-1}$, using by definition of **3**

derivative.

(c) Find the value of : **3**

$$\lim_{x \to 1} \frac{3x^2 - 4x + 1}{x^2 - 1}$$

(d) Let $f(x) = x^3 + 5x^2 - 6x + 1$. Find value of $f(0), f(1), f(2)$ **3** and $f(3)$.

7 (a) Attempt any one : **1×5=5**

    (1) Integrate $\int (4x^2 + 2x + 3)(8x + 2)dx$.

    (2) Differentiate $f(x) = b^x + x^b + e^x + b$ with respect to the variable x.

  (b) Attempt any two : **2×4=8**

    (1) Prove that $\dfrac{d}{dx}\left[\tan^2 x\right] = 2\tan x \cdot \sec^2 x$.

    (2) Prove that $\dfrac{d}{dx}\left[\sin\left(e^x\right)\right] = e^x \cos\left(e^x\right)$.

    (3) Integrate $\int (x^2 + 3x + 4)\ (2x + 3) \cdot dx$.

8 Do as directed following thirteen and fill in the **13×1=13**
blanks according to given hint in brackets :

  (1) $\dfrac{d}{dx}(\log x) = \ldots\ldots$? $[x,\ 1,\ \dfrac{1}{x}\ ]$

  (2) Let $f(x) = x^3 + 2x^2 + 3x + 4,\ f(1) = \ldots\ldots\ldots$? [4, 5, 10]

  (3) $\displaystyle\lim_{x\to 0} \dfrac{\sin 5x}{x} = \ldots\ldots\ldots$? $[5,\ 1,\ \dfrac{1}{5}]$

  (4) $\int (\cos x)dx = \ldots\ldots\ldots$? $[\sin x + c, -\sin x + c, x + c]$

  (5) What is inverse function of the identity function ?
    [Itself, zero map, e^x]

(6) $\dfrac{d}{dx}\Big[e^x\Big] = \ldots\ldots\ldots ?$ $[e^x + c,\ \log x,\ e^x]$

(7) $\displaystyle\int e^x \cdot dx = \ldots\ldots\ldots ?$ $[e^x + c,\ \log x,\ ex^{e-1}]$

(8) $\displaystyle\int x\,dx = \ldots\ldots\ldots ?$ $[x^2 + c,\ x + c,\ \dfrac{x^2}{2} + c]$

(9) $\dfrac{d}{dx}[x] = \ldots\ldots\ldots ?$ $[1, 2, \dfrac{x^2}{2}]$

(10) $\displaystyle\lim_{x\to\infty}\left[1 + \dfrac{1}{x}\right]^x = \ldots\ldots\ldots ?$ $[0,\ 1,\ e]$

(11) If $\dfrac{d}{dx}\big(f(x)\big) = g(x)$, then $\displaystyle\int g(x)\cdot dx = \ldots\ldots\ldots ?$ $[f(x) + c,\ g(x),\ 0]$

(12) $\dfrac{d}{dx}\Big[\displaystyle\int f(x)\cdot dx\Big] = \ldots\ldots\ldots ?$ $[f'(x),\ f(x),\ 0]$

(13) Let $g(x) = \dfrac{x^2 - 1}{x - 1}$, what is value of $\displaystyle\lim_{x\to 2} g(x)$? $[2,\ 3,\ 1]$

_____